Legend to Fig. 4: Comparison between forms of mechanical and thermal stress: P - longitudinal strength; F - plate cross section; M - moment of flexure; W - moment of resistance; m - intensity of moment of flexure; $\alpha_K$ - factor of stress concentration; $\sigma_\theta$ - circumferential tension; $\sigma_r$ - radial tension; P - pressure. 1, mechanical load; 2, thermal load.

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S/032/61/027/002/013/026
B134 /B206

AUTHORS: Vagapov, R. D., and Fridman, Ya. B.

TITLE: Effect of the type of load on the fatigue strength

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 2, 1961, 183-188

TEXT: The effect of the type of load must be considered in mechanical tests of solids as well as in an evaluation of the durability of structures containing cracks and being stressed (Ref. 4). After the appearance of cracks it is necessary to change the working regime for the test of massive samples on resonance machines, in order to obtain total failure, so that in most cases the conditions leading to failure cannot be defined exactly. The strength of structural elements can be evaluated best when notched samples are used and the loading process takes place in two stages, i.e., up to the formation of cracks and the crack development. For constant load amplitude the following holds: $N_r = \varphi(\sigma) + \Psi(Q)$ (1) ($N_r$ = number of loading cycles up to destruction, $\varphi(\sigma) = N_t$ = curve drawn after the first macrocrack, where $\Psi(Q) = N_r - N_t$, $\sigma$ = the amplitude of mean stress at constant

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Effect of the type ...

load amplitude Q). For a given deformation amplitude $\varepsilon$, and given displacement v, respectively, the following holds: $N_r = \varphi(\varepsilon) + \psi[Q(N)]$ (2), $\varphi(\varepsilon) = N_t$ denoting the strength for $\varepsilon$ = constant, and $\psi[Q(N)] = N_r - N_t$ the destruction time for v = constant. In the present case, fatigue strength and breaking strength were compared under equal conditions according to the curves $N_t = f(\sigma)$ and $N_r = f(\sigma)$ for two types of loading. Loading was carried out for a given amplitude of the bending moment through pure bending at a rotation of the sample (Fig. 1). The comparative tests for a given flexure amplitude v were made on the same machine by fixing the flexure, so that the initial load was equal in both cases. Smooth samples (diameter d = 7.5 mm) of rolled steel of the type 45 were tested, and the results were compared for two loading levels 34 and 48 kg/mm$^2$ (Fig. 2, black circles: destruction at given amplitude of the bending moment M, white circles: at given flexure v). The measured values coincide for $\sigma$ = 34 kg/mm$^2$, while for $\sigma$ = 48 kg/mm$^2$ the durability is twice as high for v = constant as for M = constant. Further 250 samples were tested at 34, 43, and 48 kg/mm$^2$, as well as samples with stress concentration (through notches). The experimental results show that the durability must be evaluated after

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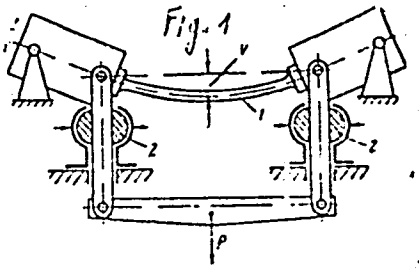
Effect of the type ...

the appearance of cracks, and the strength conditions must also be studied further, as well as the conditions of destruction for given displacement. The tests must be made in two stages, i.e., up to crack formation and up to destruction. There are 6 figures and 14 references: 11 Soviet-bloc and 3 non-Soviet-bloc.

ASSOCIATION: Moskovskiy inzhenerno-fizicheskiy institut (Moscow Institute of Engineering and Physics)

Fig. 1




Legend to Fig. 1: 1) sample, 2) hinge device fixing the flexure..

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Effect of the type ...

Legend to Fig. 2: deviation with respect to the durability of smooth samples d = 7.5 mm; a: $\sigma$ = 48 kg/mm$^2$, b: $\sigma$ = 34 kg/mm$^2$; 1: for given amplitude of the bending moment; 2: for given amplitude of flexure, P = P(logN), probability of destruction, dotted line: confidential intervals (Ref. 13)

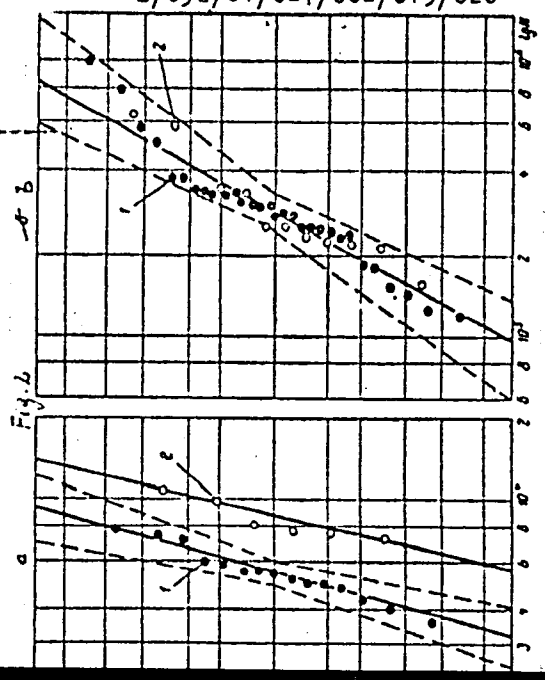

Fig. 2

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25636

S/032/61/027/007/007/012
B110/B203

15.2610

AUTHORS: Drozdovskiy, B. A., Markochev, V. M., Polishchuk, T. V., and Fridman, Ya. B.

TITLE: Method of determining the rate of brittle destruction of non-conductors

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 7, 1961, 888-894

TEXT: In samples with previously applied notch, Ye. A. Kuz'min and V. P. Pukh (Ref. 5: Sb. "Nekotoryye problemy prochnosti tverdogo tela", Izd. AN SSSR, str. 367 (1959)) found a decrease in the rate of destruction with decreasing mean stresses (at an industrial glass strength of $< 0.1$). The present paper describes a method of estimating the rate of destruction, and gives test results of concentrated bending of organic glass samples with differently sharp notches and large bottom radius of the latter. Thus, a large reserve in elastic energy was obtained before destruction. 0.8 mm wide and 2-3 μ thick silver strips sprayed on in vacuo with the aid of a template were used for measuring the rate. Current was applied by way of two textolite contacts with spring laminae. Tests were made with 50 mm distance

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Method of determining the rate of ...

between points of support on an ИМ-4А (IM-4A) machine with 0.48 mm/t yielding The first Ag strip, situated directly below the notch, is shunted with the resistor $R_0$ (Fig. 2). $R_0$ and R constitute the voltage divider connected with a 180-v battery. Before breaking, the voltage in A is zero, then $R_0$ is switched on, and the voltage rises suddenly to 150 v ($R_0 \gg R$). It blocks the oscillator tube with shock excitation, and excites the generator. Hence the voltage passes over the other delay lines ЛЗ (LZ) to the first plate pair of the double-trace cathode oscilloscope ОК-17М (OK-17M). Blocking of the tube produces, on its anode, a positive pulse which passes over the delay line to the oscilloscope. With alternating current (1 Mc) from the shock excitation generator ГУВ (GUV), the oscilloscope shows a sinusoid. When the second Ag strip breaks, $R_0$ is switched on, which, like every further strip rupture, reduces the sinusoid amplitude. When the last strip breaks, no sinusoidal voltage arrives at the oscilloscope. The photographs were shot by a Зоркий С(Zorkiy S) apparatus with Юпитер 3(Yupiter 3) object lens (light intensity 1 : 1.5) with diaphragm 1 : 2.8 and plates with 250 or 350 ГОСТ(GOST) units. The course of cracking was determined according to Fig. 3. Its mean recording velocity between two strips was the distance l divided by the time between the fracture of two adjacent strips obtained by

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counting the sinusoid peaks of the individual oscillogram steps. The authors examined polymethyl methacrylate samples of the types "C" ("S"), "X" ("Kh") (dimensions: 10•40•70 mm) and "T" ("T"). The 4-5 samples of each type hardened at first at 110-150°C were split by varying load on a resonance vibrator (1500 cps), and hardened at 70-105°C for 30-60 min. On 10•10•38 mm "S" samples with 2 mm deep notches, the authors studied the effect of notch sharpness and size of samples on the rate of destruction. The destruction stress and the maximum destruction rate decrease with increasing notch sharpness. The maximum destruction rate becomes more constant. Also the velocities obtained by graphical differentiation of the distance-versus-time curves become more uniform. For split samples, they are almost constant, for unsplit samples, they drop from 700 to 300 m/sec. Samples without a notch show the greatest roughness of fracture, those with a notch of 2 mm radius show lower roughness, those with a notch of 1 mm radius, the lowest one. The zone adjacent to the fatigue split has nearly fibrous structure with numerous crack traces propagating in parallel to each other from many centers. The principal zone is completely smooth. Since the velocity of this fracture is much lower than the final velocity, the measurement should be made with a film (32 frames per second). The

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following process is observed: (I) sudden destruction; (II) increasing velocity (incubation period: 3-4.5 mm in 0.36-2 sec); (III) linear increase (30-50 mm/sec). The fibrous-structure fracture changes to smooth fracture. After 10,000-fold, sudden increase, $v_{max}$ = 250-270 m/sec is attained with subsequent decrease. Thus, the maximum destruction rate, $v_{max}$, depends on the notch sharpness determining the destruction stress. A stress increase from 2.14 to 11.3 kg/mm$^2$ raises $v_{max}$ from 245 to 684 m/sec. The propagation rate of longitudinal elastic vibrations in polymethyl methacrylate is 1640 m/sec. $v_{max}$ for samples without a notch is 0.416 of this value, in tension tests, it is 0.55, for samples with a notch, 0.132. Thus, a destruction rate of 0.55 of the sonic velocity was obtained whereas former measurements established 0.33 for silicate glass. In elongation, the whole deformable length contributes to acceleration, in bending, the volume adjacent to the notch. An increase of the reserve in elastic energy showed little effect on the rate of destruction. An increase in dimensions under equal conditions (also of the notch) showed a high effect. An increase in the moment of resistance ($bh^2/6$) from 187 to 3,000 mm$^3$ effected

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an increase of $v_{max}$ from 231 to 513 m/sec. The authors thank Yu. A. Bulanov for assisting in the development of apparatus. There are 12 figures, 1 table and 8 references: 3 Soviet-bloc and 5 non-Soviet-bloc. The most important reference to English-language publications reads as follows:

Ref. 4: H. Schardin. Fracture, Proc. of an Intern. conference on the Atomic Mechanisms of Fracture, Swampscott, Mass., Apr., John Wiley and Sons, p. 297 (1959).

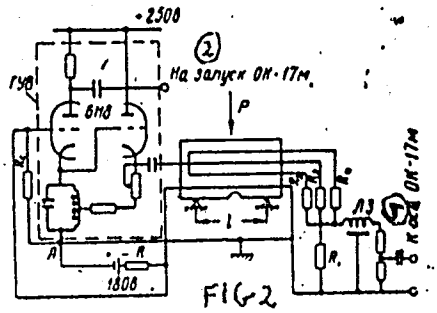


FIG 2

Fig. 2. Circuit diagram of the apparatus for determining the rate of destruction of non-conductors.
Legend: (1) to the OK-17M, (2) to the input of the OK-17M.

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MOROZOV, Ye.M.; FRIDMAN, Ya.B.

Trajectories of cracks of brittle fracture as geodetic lines on the surface of bodies. Dokl. AN SSSR 139 no.1:87-90 Jl '61.
(MIRA 14:7)

1. Predstavleno akademikom G.V. Kurdyumovym.
(Strains and stresses) (Elasticity)

S/020/62/144/002/015/028
B104/B102

AUTHORS: Fridman, Ya. B., and Morozov, Ye. M.

TITLE: Use of the Hamilton-Ostrogradskiy principle in studies of the destruction of solids

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 2, 1962, 330-333

TEXT: The "evolution function" $\oint \bar{\Phi} ds = Fds - Kds$ is defined and used as the Lagrangian function of Hamilton's variation principle. F is the "energy supply" near the tip of a crack, and K is the "energy absorption" in destruction. The crack terminal moves in the direction at which the value of $\iint \bar{\Phi} dsdt$ is extreme. The crack develops in the direction of the largest energy supply and in that of the lowest energy absorption. The following rules are derived for the crack development: (1) If the metric of space is defined by $A = \int \bar{\Phi} ds = 1$, it follows that $\delta \int dt = 0$. In this case, the mean rate of the crack development is at a maximum. (2) If the "evolution function" is time-independent, one obtains $\delta \int \bar{\Phi} ds = 0$. The metric of this space is defined by $\bar{\Phi} = 1$, and the time of crack development is minimum. If $\bar{\Phi} = \text{const}$, the crack trajectory coincides with a geodetic

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line. According to Griffiths, the potential energy of deformation of a crack is $F = \pi l^2\sigma^2/4E$. The energy dissipated as new surfaces form during the crack development is given by $K = 2Tl$. One obtains:

$$\delta\int\left[\frac{\pi(x^2+y^2)\sigma^2}{4E}-2T\sqrt{x^2+y^2}\right]\sqrt{1+y'^2}\,dx=0.$$

Conditions of Griffiths and Barenblatt (DAN, 127, no. 1 (1959); Zhurn. prikl. mekh. i tekhn. fiz., no. 4 (1961)) are derived.

ASSOCIATION: Moskovskiy inzhenerno-fizicheskiy institut
(Moscow Institute of Physics and Engineering)

PRESENTED: December 21, 1961, by G. V. Kurdyumov, Academician

SUBMITTED: December 18, 1961

FRIDMAN, Yakov Borisovich; ZILOVA, Tat'yana Kirillovna; DEMINA, Nina Ivanovna; BOKYLEV, A.V., doktor tekhn. nauk, retsenzent; EL'YASHEVA, M.A., kand. tekhn. nauk, red.; BURAKOVA, O.N., red.; NOVIK, A.Ya., tekhn. red.

[Using the method of rolled-on gratings in investigating plastic deformation and breakdown] Izuchenie plasticheskoi deformatsii i razrusheniia metodom nakatannykh setok. Moskva, Gos. nauchno-tekhn. izd-vo Oborongiz, 1962. 187 p. (MIRA 15:4)

(Deformations (Mechanics)) (Plasticity)

FRIDMAN, Ya.B., prof., doktor tekhn. nauk, red.; VLASOVA, N.A., tekhn. red.

[Strength and deformations in nonhomogeneous thermal fields] Prochnost' i deformatsiia v neravnomernykh temperaturnykh polakh; sbornik nauchnykh rabot pod red. IA.B.Fridmana. Moskva, Gosatomizdat, 1962. 254 p. (MIRA 15:3)

1. Moscow. Inzhenerno-fizicheskiy institut.
(Thermal stresses)

40063
S/145/62/000/004/001/002
D262/D308

10.7400

AUTHORS: Fridman, Ya.B., Doctor of Technical Sciences, Professor, and Morozov, Ye.M., Candidate of Technical Sciences, Docent

TITLE: Variation principles for mechanical failure

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy Mashinostroyeniye, no. 4, 1962, 56 - 71

TEXT: A formulation of a variation principle for crack growth at mechanical failure is attempted. It is based on the Hamilton-Ostrogradskiy principle, and the theories of Griffiths and Barenblatt. To find the form of crack the following form of the principle is employed: $\int_{t_0}^{t_1} \delta (T + A)\, dtA = 0.$

where: T - kinetic energy of the moving zone at the top of the crack, and A - work of forces determining the propagation of the

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Variation principles for ...

crack. Two basic cases are analyzed: 1) The beginning of the crack takes place on the surface of the body; 2) the beginning of the crack lies inside the body. 'Development function', 'supply function', 'absorption function', are introduced and the final equation deduced. In several examples the experimental results are compared with the calculated crack trajectories to show that they confirm the correctness of the calculations. There are 7 figures.

ASSOCIATION: Moskovskiy inzhenerno-fizicheskiy institut (Moscow Institute of Physics and Engineering)

SUBMITTED: April 29, 1961

Card 2/2

S/782/62/000/000/001/003

AUTHOR: Fridman, Ya.B.

TITLE: On some laws of mechanical and thermal strength.

SOURCE: Prochnost' i deformatsiya v neravnomernykh temperaturnykh polyakh; sbornik nauchnykh rabot. Ed. by Ya.B.Fridman. Moscow. Gosatomizdat, 1962, 3-29.

TEXT: Structural elements have acquired increasingly complex shapes; their operation conditions are complicated by spatial nonuniformity (at a given moment of time) and time nonconstancy (at a given point in space). The strength and the failure of structural components are controlled by somewhat different laws if the stresses applied are produced by loads and by deformations (e.g., thermal), respectively, especially from the point of view of relaxation phenomena. These laws relate to mechanical and thermal strength, i.e., to the analysis of yield, creep, and single static and fatigue failure, as well as failure from mechanical stresses on the one hand and thermal stresses on the other. A classification of loads into four types is proposed: (1) shock loads; (2) short-term loads; (3) long-lasting loads; and (4) repetitous loads. True shock loads involve primarily wave processes and inertial-force phenomena and cannot, therefore, be simulated statically; those aspects of shock phenomena which do not involve wave and inertia processes (e.g., impact resilience or toughness) can, in principle, be replaced by static processes (e.g., by

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the testing of notched specimens). Static processes (both in the laboratory and in the field) may be governed by given loads or by given deformations or by given combinations of loads and deformations and may, therefore, be affected more or less by relaxation. Thermal stresses are governed by given deformations and, hence, are subject to deformation-dependent relaxation. As the load increases in magnitude and duration, a superimposition of elastic and plastic deformation and of a failure process occurs. In each of these 3 deformation stages both gradual and jumplike decreases in strength occur. The failure process is spread over a longer time if the loading is nonuniform and if the structure and the material properties are nonuniform. The summary duration of a process (e.g., time to fissure formation or to total failure) is not meaningful in distinguishing gradual and sudden failure processes or in investigating existing kinematic relationships. The latter are manifested clearly upon constructing the curves of the deformation acceleration $j_\varepsilon$ and failure acceleration $j_{fiss}$ (both in $sec^{-2}$ per unit length); in the subcritical state both of these accelerations are negative, in the above-critical state positive. Four periods are to be distinguished in yield, creep, and failure processes: (1) an incubation or initially-accelerated period ($j>0$, $v>0$); (2) a deceleration period ($j<0$, $v>0$); (3) a quasi-stationary period ($j=0$, $v=0$ or const.); and (4) an accelerated (at times, avalanche-like) terminal period ($j>0$, $v>0$). The existence of an incubation period is shown with reference to curves published earlier by H.J.Tapsell (in "Creep of Metals," Oxford University Press, 1931, cited in its Russian translation, ONTI,

On some laws of mechanical and thermal strength. S/782/62/000/000/001/003

Moscow, 1934) and the erroneousness of the currently widely adopted division of the creep process into only three periods or stages, without regard to the incubation period, is demonstrated, especially with reference to extremely rapid and time-variable processes, such as those involved in the operation of rockets, nuclear reactors, jet engines, etc. The kinetic approach is rendered inescapable by the nonstationary nature of many such processes, which can be engendered both by external factors (e.g., temperature gradients during starting, stopping, and changes in operational regime) and by internal factors (e.g., structural or physico-chemical process changes under constant external load). The relationships of the energy delivery and the energy absorption in such processes are reviewed. The need for a specific assessment of the dimensional localization of thermally engendered deformation and failure processes as pertaining to a macro scale (dimensions of the order of those of the structural element itself), micro scale (dimensions of the order of those of the metallic grain), and submicro scale (dimensions of the order of those of the interatomic distances in a solid) is emphasized; macroscopic creep phenomena, for example, may find a meaningful explanation in terms of submicroscopic failures only. The one-time consideration of solids as continuous, perfectly structured, and purely elastic, as embodied in the theory of elasticity and plasticity, must be replaced by the theoretical model of a solid comprising initial defects (antedating the application of any load) and discriminating only between allowable and non-

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allowable structural discontinuities, since some discontinuities, such as lattice dislocations, exist at all times. Such considerations alone can explain the otherwise unfathomable weakening of brittle bodies under biaxial tensile stress, e.g., under sudden local cooling. Both under increasing and under constant loads or under constant deformation strengthening ($j < 0$) and weakening ($j > 0$) processes occur as a result of macroscopic structural changes (e.g., weakening through neck formation) or microscopic modifications (e.g., hardening through grain-structure changes). Regulating control over the kinetics of deformation and failure (essentially, their retardation) can be exerted by changing the external factors (loads, temperature distributions, and the form and conditions of fastening or other restraint) or the internal factors (structure, composition, surface covering, etc.). An enlargement of the elastic-energy reserve of the load-exerting system leads to a slower relaxation of the load with growing deformation and, hence, to a sharper, and at times earlier, inception of plastic deformation and failure and their respective critical states. Thus, both the force and the stress distribution in statically indeterminate systems are greatly affected by plasticity, and the time-dependent changes of both the mechanical and the thermal loads and the strength of structural components must be taken into consideration. Laboratory techniques must be developed to simulate nonstationary conditions, including those occurring under repetitive temperature changes (thermal fatigue), sharp temperature changes (thermal shock), and

On some laws of mechanical and thermal strength. S/782/62/000/000/001/003

various combinations of varying mechanical and thermal actions, wherever notches, welds, etc., engender nonuniformities and nonstationarities in loading. A novel method is shown, in which high-rate heating and cooling is achieved by means of immersion in "boiling" (bubbling) powder through which a jet of hot or cold gas is blown. Outlines for future research, especially relative to an assessment of the safety of a given stress configuration with reference to creep, thermal fatigue, thermal stability, etc., are set forth. Statistical approaches to the probability of the incidence of certain loads or load combinations are termed essential. Existing bibliography is briefly analyzed. There are 2 figures, 2 tables, and 16 references (14 Russian-language Soviet, 1 Russian-language translation of H.J.Tapsell's "Creep of Metals," and 1 English-language paper by E.Glenny et al., J.Inst.Met., London. v.87, 1959, 294).

ASSOCIATION: None given.

Card 5/5

FRIDMAN, Ya.B.; ZILOVA, T.K.; SHEKHTER, V.Ya.; SHAPOVALOV, L.A.; NOVOSIL'TSEVA, N.I.

Behavior of sheet metals during biaxial pulling. Issl. splav. tsvet. met. no.4:185-203 '63. (MIRA 16:8)

(Sheet metal--Testing)

L 11418-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JD
S/032/63/029/005/012/022

54

AUTHORS: Shapovalov, L. A. and Fridman, Ya. B.

TITLE: On the conditions of kinetic similarity during mechanical tests

PERIODICAL: Zavodskaya laboratoriya, v. 29, no. 5, 1963, 590-593

TEXT: In modelling processes of deformation and destruction in mechanical tests, static concepts are inadequate and other types of similarity, especially the kinetic, must be taken into account. The author applies the methods of modelling to a study of the kinetics of fracture of a visoelastic body using the $\pi$-theorem of dimensional analysis to obtain the dynamic similarity criterion and to a study of simplified brittle fracture of an elastic medium by means of a very simplified mechanical model. There are two figures.

ASSOCIATION: Moskovskiy inzhenerno-fizicheskiy institut (Moscow Engineering-Physics Institute)

ja/CR
Card 1/1

L 11401-63 BDS

S/032/63/029/005/015/022

45

AUTHORS: Zilikova, T. K., Novosil'tseva, N. I., Palkin, B. A., Ryazanov, N. V. and Fridman, Ya. B.

TITLE: Method of testing sheet materials for biaxial extension at a different reserve of elastic energy

PERIODICAL: Zavodskaya laboratoriya, v. 29, no. 5, 1963, 600-604

TEXT: Analysis of a number of operational failures such as the explosion of the British "Comet" jet aircraft has shown that with a rise in the reserve of elastic energy in the presence of defects not only acceleration of deformation and failure occur, but also a reduction in the strength of a material can be expected. A device has been constructed to test biaxial extension of sheet material at a different reserve of elastic energy by means of pneumatic (gaseous nitrogen) or hydraulic (liquid AMG-10), arranged so that the working part of the test piece was in a zone of practically symmetrical biaxial extension. In tests of the influence of the working medium transmitting pressure to the test piece on the strength and nature of failure of the sample, test pieces were broken down into rather large pieces in the hydraulic test and into fine pieces in the pneumatic. In tests of the influence of the volume of the working medium it was found that increase in the volume of the container did not lead to substantial change in the kinetics, although the rate of deformation increased. There are 6 figures and 2 tables.

Card 1/1 ja/lb

ACCESSION NR: AP4037065 S/0129/64/000/005/0021/0028

AUTHOR: Drozdovskiy, B. A.; Pevzner, L. M.; Tarantova, A. S.; Fridman, Ya. B.; Kishkin, S. T.

TITLE: Effect of carbon content on the tensile strength of structural steel sheets

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 5, 1964, 21-28

TOPIC TAGS: high strength steel, superstrength steel, medium alloy steel, VKS-1 steel, solid fuel rocket, rocket case, rocket case material, steel notch sensitivity

ABSTRACT: The effects of carbon content, melting conditions, and heat treatment conditions (primarily tempering temperature) on the strength and ductility (in conventional tensile tests and under biaxial tension), and notch sensitivity of two superstrength steels VKS-1 and [AISI]4137-Co are investigated. Four grades of VKS-1 (0.30, 0.39, 0.45, or 0.53% carbon; 0.89% manganese; 1.2% silicon; 1.87% chromium; 0.72% nickel; 0.49% molybdenum; .05% vanadium; 0.011% sulfur; and 0.008%

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ACCESSION NR: AP4037065

phosphorus) were melted in an open atmosphere induction furnace. The 4137-Co (0.40% carbon, 0.84% manganese, 1.02% silicon, 1.32% chromium, 0.36% molybdenum, 0.19% vanadium, and 1.1% cobalt) was melted either in an open atmosphere induction furnace or in a consumable electrode vacuum arc furnace. Both steels were rolled into sheets 1 mm (VKS-1) or 1.5 mm (4137-Co) thick. Special care was taken to prevent surface decarburization. Tests revealed that tensile and yield strength of VKS-1 steel increased steadily with increased carbon content up to 0.45%. Steel with 0.45% carbon tempered at 150C has a tensile strength of 240—245 kg/mm$^2$ but low ductility and a high notch sensitivity. When tempered at 220C the steel had a tensile strength of 220—230 kg/mm$^2$, yield strength of 180 kg/mm$^2$, and elongation 6.5%. Further increase of carbon content brings about premature brittle failures. Elongation remains almost unaffected by increase of carbon content from 0.30 to 0.45% but notch sensitivity increases very sharply. Under conditions of biaxial tension the strength of VKS-1 increased with higher carbon content only up to 0.39%. With 0.30—0.39% carbon the fracture is ductile and the strength is higher than that in uniaxial tension. As the carbon content is increased to 0.45% the fracture becomes brittle, the

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ACCESSION NR: AP4037065

strength drops and goes below the level noted in uniaxial tension. Generally, the maxima on the strength-carbon content or strength-tempering temperature curves for biaxial tension do not coincide with those for uniaxial tension but occur at carbon contents and tempering temperature at which the strength in uniaxial tension amounts to about 200 kg/mm$^2$. The behavior of 4137-Co steel followed a similar pattern. It was found, however, that vacuum arc melting improved ductility, especially in biaxial tension, and lowered notch sensitivity. No brittle failures were observed even at tempering temperature as low as 150C. No correlation between the strength in biaxial tension and any characteristics in uniaxial tension was found in either steel. It is concluded that the problem of improvement of structural strengtn is closely related to the prevention of brittle fracture at higher uniaxial strength. This can be achieved by complex alloying with a minimum segregation of components; improved metallurgical processes ensuring higher purity of metal; control of solidification processes to prevent microsegregation and improve the strength of interdendritic boundaries; and finally by thermomechanical treatment with a maximum grain refinement.

Card 3/4

ACCESSION NR: AP4037065

ASSOCIATION: none

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| SUBMITTED: 00 | DATE ACQ: 05Jun64 | ENCL: 00 |
| SUB CODE: MM | NO REF SOV: 004 | OTHER: 004 |

Card 4/4

ACCESSION NR: AP4035091 S/0032/64/000/005/0587/0592

AUTHORS: Demina, N. I.; Zilova, T. K.; Fridman, Ya. B.

TITLE: Mechanical testing methods for sheet materials under biaxial tension

SOURCE: Zavodskaya laboratoriya, no. 5, 1964, 587-592

TOPIC TAGS: stress strain, plastic deformation, axial tension, transverse deformation, sheet metal, elastic limit, meter EID 3

ABSTRACT: Four different methods were used to study the stress-strain characteristics of sheet metals under elastic and plastic deformations. Elastic deformations were measured by means of strain gauges and an EID-3 electronic meter; plastic deformations by means of rolled-on grids. The first was an axial tension method on smooth, wide specimens, (width-to-thickness ratio, b/t, from 2.5 to 50) of annealed AMTs, VAD-23 and D16T alloys. The results showed no indication of biaxial tension in specimens for which $b/t < 30$. In all cases the transverse deformation was in compression. The second method consisted of forming a thin groove (3 t mm wide, $t \approx 6$ mm) along the width, on both sides, of a 30 t mm wide V95T alloy. The results showed a single-axis stress state during elastic defor-

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ACCESSION NR: AP4035091

mation and a biaxial stress with $\sigma_2/\sigma_1 \approx \frac{1}{2}$ under plastic deformation. The third test was a flexural loading of the same alloys with b/t = 3 and 15. This yielded a result identical to those obtained by the second method. In the last method ellipsoidal segments of AMTs, D19T, and copper sheets were fastened at their edges and subjected to internal pressure. The results showed that both longitudinal and transverse deformations were positive, under both elastic and plastic deformations, with $\sigma_2/\sigma_1 \approx 0.7$. Orig. art. has: 5 figures, 5 formulas, and 2 tables.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 20May64 ENCL: 00

SUB CODE: MM NO REF SOV: 004 OTHER: 004

Card 2/2

DROZDOVSKIY, B.A.; PEVZNER, L.M.; TARANTOVA, A.S.; FRIDMAN, Ya.B.; KISHKIN, S.T.

Effect of carbon content on the strength of structural sheet steel under the effect of tension. Metalloved. i term. obr. met. no.5:21-28 My '64. (MIRA 17:6)

ACCESSION NR: AP4019486 S/0078/64/009/003/0623/0632

AUTHORS: Fridman, Ya.; Dolgashova, N.V.

TITLE: Fluorocarbonates of the rare earth elements

SOURCE: Zhurnal neorg. khimii, v. 9, no. 3, 1964, 623-632

TOPIC TAGS: rare earth element, fluocarbonate, rare earth fluorocarbonate, praseodymium fluorocarbonate, neodymium fluorocarbonate, erbium fluorocarbonate, absorption spectra, fluorocarbonate complex, equilibrium constant, $PrCO_3F.2H_2O$, $NdCO_3F.7H_2O$, $ErCO_3F.2.5H_2O$, $Pr_6O_{11}$, $Nd_2O_3$, $Er_2O_3$

ABSTRACT: A spectrophotometric investigation was made of fluorocarbonate solutions of Pr, Nd and Er and of the solid phases recovered from the solutions. Examination of the spectra of solutions containing Pr, Nd, Er chlorides, $K_2CO_3$ and KF shows that the fluoride ion decreases the optical density of the rare earth carbonates, and the absorption bands are shifted slightly

Card 1/3

ACCESSION NR: AP4019486

toward the shorter wave lengths in the case of Pr and Er, but there is practically no shift in Nd. Pr $(CO_3)_3F^{4-}$, $Pr(CO_3)_2F_2^{3-}$, $PrCO_3F_3^{2-}$, $Nd(CO_3)_2F^{4-}$, $NdCO_3F_2$ and $Er(CO_3)_2F_2^{3-}$ fluorocarbonate complexes are formed in the solutions according to the general equation: $M(CO_3)_m^{2-2m} + pF^- = M(CO_3)_qF_p^{3-(2q+p)} + (m-q)\,CO_3^{2-}$. Equilibrium constants, based of the following relationship were calculated for several of the reactions:

$$\frac{D-D_0}{D} = \frac{\sum_{p=0}^{n}\sum_{q=0}^{m} R_{p,q}(\lambda_{m,0}-\lambda_{p,q})\,t^p\,[CO_3]^{p+q-m}}{\sum_{p=0}^{n}\sum_{q=0}^{m} R_{p,q}\lambda_{p,q}\,t^p\,[CO_3]^{p+q-m}}$$

D = optical density; $\lambda_{p,q}$ = =coefficients of extinction; $\lambda_{m,0}$ = coefficient of extinction of $M(CO_3)_m^{3-2m}$, R p,q = constants characterizing formation of the complex; t = equilibrium concentration of the $F^-$ and $CO_3^{2-}$ ions. Equilibrium constants for the reactions $Nd(CO_3)_4^{5-} + F^- = Nd(CO_3)_3F^{4-} + CO_3^{2-}$ $Nd(CO_3)_3F^{4-} + F^- = NdCO_3F_2^- + 2CO_3^{2-}$, are 0.441 and 0.254, respectively.

Card 2/3

ACCESSION NR: AP4019486

The compounds $PrCO_3F.2H_2O$, $NdCO_3F.7H_2O$, and $ErCO_3F.2.5H_2O$ were separated from the fluorocarbonate solutions of Pr, Nd and Er. Thermographic and crystallooptical studies show that the dehydration proceeds stepwise to the completely anhydrous compounds of the general formula $MCO_3F$. At 850C these fluorocarbonates decompose with to form the oxides $Pr_6O_{11}$, $Nd_2O_3$ and $Er_2O_3$. Orig. art. has: 3 tables, 12 figures and 18 equations.

ASSOCIATION: Akademiya nauk Kirg. SSR (Academy of Sciences, Kirg. SSR)

SUBMITTED: 04Nov62 DATE ACQ: 31Mar64 ENCL: 00

SUB CODE: CH NO REF SOV: 006 OTHER: 001

Card 3/3

ACCESSION NR: AP4038521 S/0020/64/156/003/0537/0540

AUTHOR: Morozov, Ye. M.; Polak, L. S.; Fridman, Ya. B.

TITLE: Variational principles of crack development in solids

SOURCE: AN SSSR. Doklady*, v. 156, no. 3, 1964, 537-540

TOPIC TAGS: crack development, free energy, variational mechanical principle, thermodynamics, reversible process, irreversible process, Hamiltonian principle

ABSTRACT: It has been observed by A. P. Alexandrov (Vestn. AN SSSR #7-8, 1944) that the focus of a mechanical rupture is bounded by a circular arc. The present paper is an attempt to develop, on the basis of this observation, a physical explanation of the process in terms of variational principles of mechanics and of thermodynamics of both reversible and irreversible processes. Various cases are considered of which the extreme cases are: (1) Stationary equilibrium rupture - the development of the crack is caused by slow increase of external forces. The crack ceases to grow if the forces stop to increase. The condition for this is, that the variation of the free energy $\delta L$ must be zero, if the crack trajectory is varied. (2) Nonstationary nonequilibrium rupture. This case is characterized

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ACCESSION NR: AP4038521

by $\delta L \neq 0$. Since L represents the energy, and can be considered as a Lagrangian function, the Hamiltonian principle can be applied: $\int_{t_0}^{t} \delta L dt = 0$.

Intermediate cases are also considered, where the principle of minimal entropy increase is involved. Orig. art. has: no figures, 5 equations.

ASSOCIATION: Moskovskiy inzhenerno - fizicheskiy institut (Moscow Engineering and Physics Institute)

SUBMITTED: 02Nov63 DATE ACQ: 09Jun64 ENCL: 00

SUB CODE: ME NO REF SOV: 011 OTHER: 002

Card 2/2

L 52223-65 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b) MJW/JD

ACCESSION NR: AP5009919 UR/0032/65/031/004/0470/0479
620.171:539.22

AUTHORS: Miklyayev, P. G.; Fridman, Ya. B. 23 B

TITLE: On the method for evaluating the mechanical properties of metals 15

SOURCE: Zavodskaya laboratoriya, v. 31, no. 4, 1965, 470-479

TOPIC TAGS: elasticity modulus, shear strength, compression strength, tensile strength, anisotropy, mechanical property / V95 alloy, VM65-1 alloy, MA8 alloy

ABSTRACT: On the assumption of orthotropy, a method is outlined for evaluating the anisotropic strength and elasticity characteristics of semifinished metallic products. The three anisotropic elasticity constants E, G (rigidity), and $\mu$ (Poisson's coefficient) are defined by the expressions

$$\frac{E_{1'1'}}{E_{11}} = \frac{\lambda}{\lambda\cos^4\varphi + 2B\cos^2\varphi\sin^2\varphi + \sin^4\varphi},$$

$$\frac{G_{1'2'}}{G_{12}} = \frac{1}{1-(1-C)\sin^2 2\varphi},$$

Cord 1/3

L 52223-65

ACCESSION NR: AP5009919

$$\mu_{1,2} = \frac{\mu_{12} - \frac{1}{4}(1 + \lambda - 2B)\sin^2 2\varphi}{\lambda\cos^4\varphi + 2B\cos^2\varphi\sin^2\varphi + \sin^4\varphi},$$

where $B = \frac{1}{2}\left(\frac{E_{22}}{G_{12}} - 2\mu_{12}\right)$;

and $C = \frac{G_{12}}{E_{22}}(1 + 2\mu_{12} + \lambda)$.

The theoretical expression for E is then compared with experimental points obtained for hot-rolled and annealed chromium-molybdenum steel sheets. The agreement is found to be good. Under plastic deformation and rupture the tension or compression strength $\sigma$ is defined by

$$\sigma_\varphi = \frac{\sigma_0}{\cos^4\varphi + b\sin^2 2\varphi + c\sin^4\varphi},$$

where $c = \frac{\sigma_0}{\sigma_{90}}$; $b = \frac{\sigma_0}{\sigma_{45}} - \frac{c+1}{4}$

and the shear strength by

$$\tau_\varphi = \frac{\tau_0}{\cos^4\varphi + b_1\sin^2 2\varphi + c_1\sin^4\varphi}.$$

Card 2/3

L 52223-65

ACCESSION NR: AP5009919 O

Calculations using these formulae were compared with experimental results on similar steel specimens with those used for elasticity moduli, and agreement was found to be good. Other anisotropic property studies were carried out on V95, VM65-1, and MA8 alloys with very good agreement between theory and experiment. Of these, the VM65-1 specimen showed the largest anisotropy in its yield stress: 27.7 $kg/mm^2$ in longitudinal direction and 12.7 $kg/mm^2$ in the transverse direction. These and other data on the anisotropic strength characteristics of the alloys are given in tabular form. These anisotropy data were limited to longitudinal and transverse directions only, and hence do not necessarily include minimum or maximum anisotropic values. Significant departures between theory and experiment were observed only in specimens with initially nonhomogeneous properties. Orig. art. has: 8 figures, 7 formulas, and 4 tables.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NO REF SOV: 020 OTHER: 001

Card 3/3

L 21750-66 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(k) JD/HW

ACC NR: AP6008068 (N) SOURCE CODE: UR/0032/66/032/002/0217/0222

AUTHOR: Miklyayev, P. G.; Fridman, Ya. B.

ORG: none

TITLE: Evaluation of the mechanical properties and breaking characteristics of anisotropic metals

SOURCE: Zavodskaya laboratoriya, v. 32, no. 2, 1966, 217-222

TOPIC TAGS: crystal anisotropy, solid mechanical property, mechanical fracture, metal physics

ABSTRACT: The authors consider anisotropy in mechanical properties and breaking characteristics of pressure treated semifinished products made from V95 and VM65-1 high strength alloys. It is shown that the anisotropy in characteristics associated with fracture as well as the nature of the fracture itself are determined mainly by the geometric orientation of the structure (this probably pertains in a certain measure to other materials also). In V95 alloy, which has a laminar grain, a change in the angle of the specimens to the direction of deformation is accompanied by a transition from plastic to brittle fracture which may result in brittle fracture of massive parts due to transverse stresses. Final fracture of all specimens, regardless of ductility, takes place basically along the grain boundaries. The macroscopic fracture surface

Card 1/2 UDC: 620.17

L 21750-66
ACC NR: AP6008068

coincides with the direction of the fiber in the specimen with the exception of longitudinal specimens and specimens inclined 15° to the direction of deformation. Fracture of specimens made from anisotropic metals takes place in many cases along areas for which the curves for stresses and resistances make first contact, and not along the surfaces acted upon by maximum tangential or norms. stresses. Orig. art. has: 4 figures, 5 formulas.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 008/ OTH REF: 001

Card 2/2

L 06593-67 EWT(m)/EWP(w)/EWP(t)/ETI IJP(c) JD/EM

ACC NR: AP6029856 SOURCE CODE: UR/0032/66/032/008/0977/0984

58
57
B

AUTHOR: Morozov, Ye. M.; Fridman, Ya. B.

ORG: Moscow Engineering-Physics Institute (Moskovskiy inzhenerno-fizicheskiy institut)

TITLE: Crack analysis as a method of determining fracture characteristics

SOURCE: Zavodskaya laboratoriya, v. 32, no. 8, 1966, 977-984

TOPIC TAGS: material fracture, elasticity theory, crack propagation, thermodynamic analysis, variational calculus, approximation method

ABSTRACT: The variational principle of crack analysis based on qualitative experimental and analytical techniques was used to study causes of fracture. Mechanical and thermodynamic methods were employed in determining crack trajectories and their mode of propagation. The functional

16

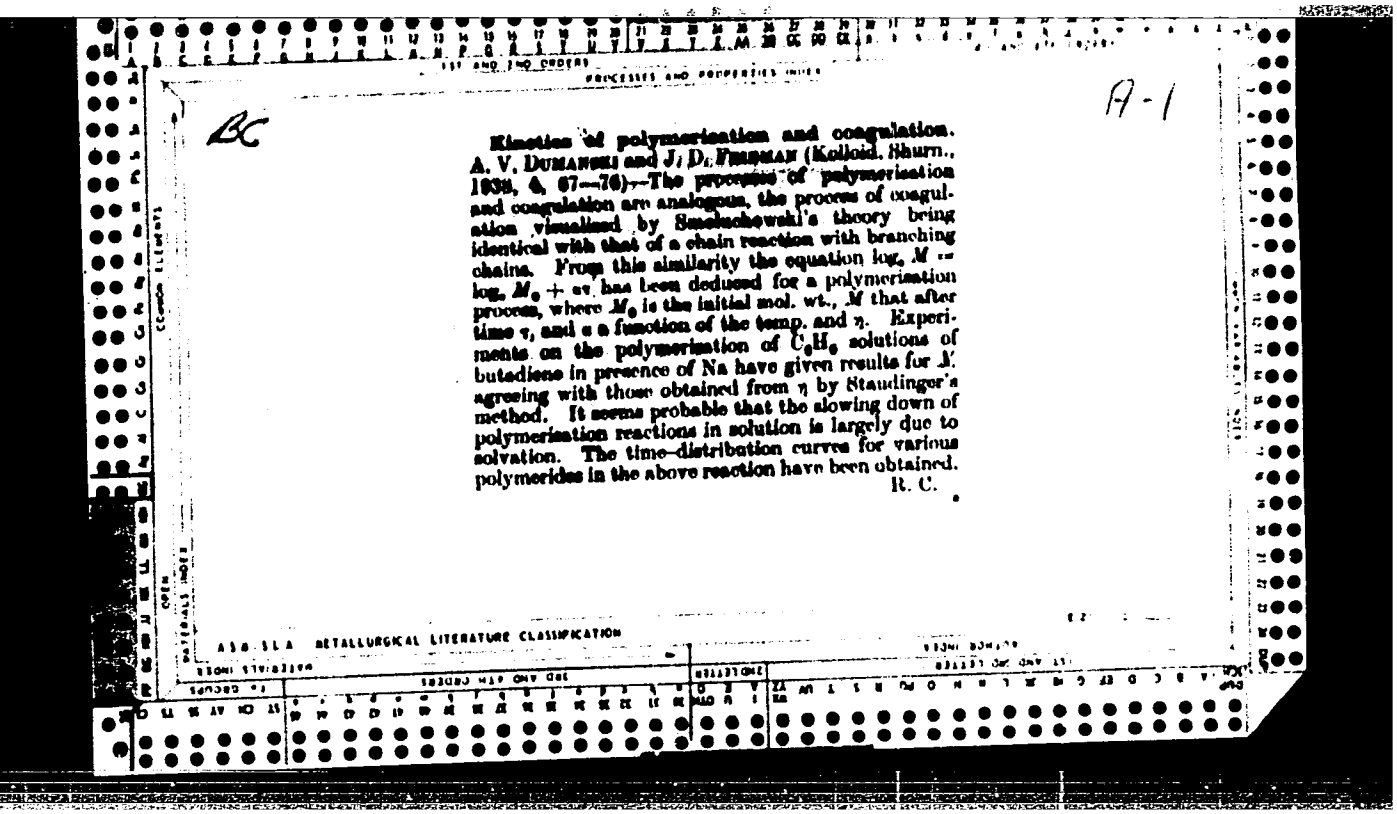
$$E=\int_{l_0}^{l(t)} L\,ds$$

was related to both equilibrium ($\delta E = 0$) and nonequilibrium cracks $\int_{t_0}^{t_1} \delta E\,dt = 0.$ ,

where $E$ is the difference between the energy absorbed $\int \gamma\,dS$ and supplied $\int F\,dS$ to either type of crack. Since cracks form in zones of maximum energy absorption (stress

UDC: 620.17

Card 1/2



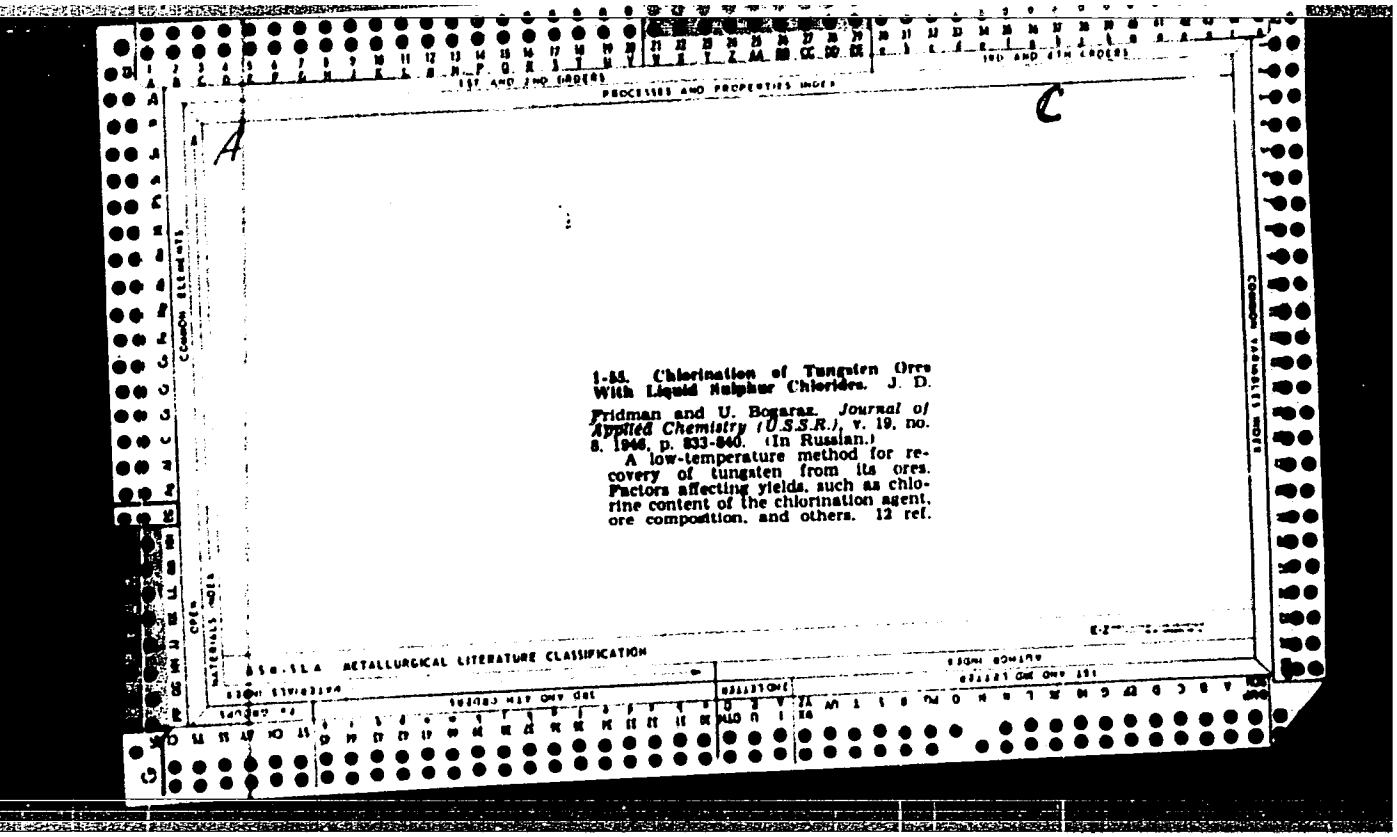
BC

A-1

Kinetics of polymerisation and coagulation. A. V. DUMANSKI and J. D. FREIMAN (Kolloid. Shurn., 1938, 4, 67—76).—The processes of polymerisation and coagulation are analogous, the process of coagulation visualised by Smoluchowski's theory being identical with that of a chain reaction with branching chains. From this similarity the equation $\log M = \log M_0 + \alpha\tau$ has been deduced for a polymerisation process, where $M_0$ is the initial mol. wt., $M$ that after time $\tau$, and $\alpha$ a function of the temp. and $\eta$. Experiments on the polymerisation of $C_6H_6$ solutions of butadiene in presence of Na have given results for $M$ agreeing with those obtained from $\eta$ by Staudinger's method. It seems probable that the slowing down of polymerisation reactions in solution is largely due to solvation. The time–distribution curves for various polymerides in the above reaction have been obtained.

R. C.

A 38 SLA METALLURGICAL LITERATURE CLASSIFICATION



1-55. Chlorination of Tungsten Ores With Liquid Sulphur Chlorides. J. D. Fridman and U. Bogaraz. *Journal of Applied Chemistry (U.S.S.R.)*, v. 19, no. 8, 1946, p. 833-840. (In Russian.)

A low-temperature method for recovery of tungsten from its ores. Factors affecting yields, such as chlorine content of the chlorination agent, ore composition, and others. 12 ref.

[illegible], I. [illegible].

[illegible]out the mechanism of the reduction of complex ions. I. 1[illegible]

Theoretical data are developed according to the case of reduction of transition elements, in particular tungsten ions, entering into the composition of a complex compound, depending on whether these ions are acceptors or donors of electrons.

Lab. of Inorganic Chem. of the Kirgiz Branch of the Acad. of Sci. USSR.
December 10, 194[illegible]

SO: Journal of General Chemistry (USSR) 18 (80) No. 6 (1948)

FRIDMAN, YA. D.

42100. FRIDMAN, YA. D., YULATOVA, P. KH. Okrivykh. Reduktometrive- ekorotitrvaniya-vol'framatov i khromatov. Trud'ykim. In- Ta (Kir. piz filtalakad. Naukccp ). vyp 2, 1947 IED. 1948 l. s 149-56

SO: Letopis' Zhurnal'nykh Statey, Vol. 47, 1948

FRIDMAN, Ya.D.; ZINOV'YEV, A.A.; KHAKIMOV, Z.V., otvetstvennyy redaktor.

[Organization of the salt industry in the Kirghiz S.S.R.] Organizatsiia solepromyslov v Kirgizskoi SSR. Frunze, 1948. 28 p.(MLRA 7:11)
(Kirghizistan--Salt mines and mining) (Salt mines and mining--Kirghizistan)

**Mechanism of the reduction of complex ions. II. Effect of salts of nickel, cobalt, and chromium, or reactions of displacement of metals.** Ya. D. Fridman and R. Kh. Buketova (Kirgiz Branch Acad. Sci. U.S.S.R.). *Zhur. Obshchei Khim.* (*J. Gen. Chem.*) **20**, 1633–42(1950); cf. *C.A.* **45**, 925*d*.—The inhibition, by salts of Ni, Co, or Cr, of the displacement of a nobler metal from its salts by a less noble metal, is attributed to complex-ion formation. Thus, in the complex cation $[Ni(H_2O)_6]^{++}$ the effective at. no. of Ni is $28 + 2 \times 6 - 2 = 38$, i.e. with 2 electrons in excess of the nearest inert gas. Consequently, this ion is capable only of losing electrons, i.e. is a reductant, not an oxidant. On the other hand, the Ni ← $OH_2$ bond results in a weakening of the O—H bond, and, consequently, the reduction of $H^+$ ions to H is facilitated. Whether a metal such as Zn will predominantly evolve $H_2$, according to $Zn + 2H^+ \rightarrow Zn^{++} + H_2$, or displace from its salts the metal M, according to $Zn + M^{++} \rightarrow Zn^{++} + M$, depends on the relative free energies of these 2 processes. The condition for predominant evolution of $H_2$ is $\log([Me^{++}]/[H^+]^2) < n(E_M - E_H)/0.06$, where $E$ designates the standard potentials of H and M, resp. With the overvoltage $\eta$ taken into account, the condition for simultaneous evolution of $H_2$ and displacement of metal M is $\log([Me^{++}]/[H^+]^2) = n(E_M - E_H - \eta)/0.06$. If, owing to the weakening of the O—H bond in the $[Ni(H_2O)_6]^{++}$ complex, evolution of $H_2$ is facilitated, i.e. $\eta$ is lowered, evolution of $H_2$ must acquire predominance over displacement of metal, i.e. the latter process will be inhibited. This was observed in the displacement of $Sn^{++}$ by Zn in the concn. range $[Sn^{++}]/[H^+]^2 \leq 10^{4.6}$. Addn. of $NiCl_2$ lowers the degree of pptn. of Sn without changing the shape of the curve. The effectiveness of $NiCl_2$ in inhibiting the displacement of Sn from $SnCl_4^{++}$ varies with the nature of the displacing metal, increasing in the order Mg, Al, Zn. Salts of Cr and Co have the same effect as Ni, the effectiveness increasing in the order $CrCl_2 < NiCl_2 < CoCl_2$, i.e. in the order of decreasing ionic radius, and without regard to the standard potentials. The same salts lower the degree of displacement of Pb from $PbCl_2$ by Zn, but do not affect the displacement of metal from $HgCl_2$ or $CuCl_2$, in accordance with the prediction that inhibiting effects of Ni salts can be expected only in the concn. ranges $[Bi^{+++}]^2/[H^+]^3 < 10^{-30.7}$ and $[Cu^{++}]/[H^+]^2 < 10^{-18}$, resp. An anomaly is found in the case of $SbCl_3$ from which the pptn. of Sb by Zn is strongly inhibited by $NiCl_2$ even outside of the concn. range ($[Sb^{+++}]^2/[H^+]^3 < 10^{-39}$) where such an effect can be expected. This anomaly is evidently due to a sp. interaction between $SbCl_3$ and $NiCl_2$, not to a promotion of the evolution of $H_2$.

N. Thon

FRIDMAN, Ya. D.

CH

Physicochemical property of the tertiary salt deposits in Tyan-Shan. Ya. D. Fridman and A. A. Zinov'ev. *Trudy Khim. Inst., Kirgiz Filial Akad. Nauk S.S.S.R.* No. 4, 13–24(1951).—The tertiary system of NaCl, $Na_2SO_4$, and $CaSO_4$ in water is investigated. On the basis of a large no. of expt. data for deposits of various regions, it is concluded that the phase diagram of the system $Na^+Ca^{++}/SO_4^{--}Cl^-$ in water explains the basic feature of salt deposits in this area. This is used to explain qualitatively the genesis of glauberite which is found extensively in the Tyan-Shan salt deposits.

Paul V. Fenn

(1)

FRIDMAN, Ya. D.

The digestion of salt rocks containing glauberite. Ya. D. Fridman and A. A. Zinov'ev. *Trudy Khim. Inst., Kirgiz. Filial Akad. Nauk S.S.S.R.* No. 4, 25-38(1951).—The salliferous rocks are shown to contain mainly NaCl, $Na_2SO_4$, and $CaSO_4$. The equil. of $Na^+$, $Ca^{++}$, and $SO_4^{--}$ ions is investigated, and it is shown that the rate of isolation of mirabilite and gypsum is directly related to the degree of decompn. of glauberite. Since the speed of soln. of $Na_2SO_4$ is a function of NaCl concn., a method of forcing water through the salt layers is suggested. The insol. material is shown to contain up to 70% $CaSO_4$ and can be used for the *manuf.* of *construction materials.* Paul Y. Feng

2

USSR. Oxidation-reduction properties of complex compounds. Ya. D. Fridman. *Trans. Sektora Platiny i Drug. Blagorod. Metal., Inst. Obshch. i Neorg. Khim., Akad. Nauk S.S.S.R.*, 1931, No. 25, 170-88(1931).—Numerous examples are presented for the changes of oxidation or reduction properties by the formation of complexes. These changes are discussed from the points of view of thermodynamics and of kinetics. Werner Jacobson

FRIDMAN, Ya. D.

On the Oxidation-Reduction Theory. page 740. Sbornik statey po obshchey khimii (Collection of Papers on General Chemistry), Vol 1, Moscow-Leningrad, 1953, pages 762-766.

Inst of Chemistry, Kirgiz Affiliate, Acad Sci USSR

FRIDMAN, YA. D., AND ZINOV'YEV, A. A.

Glauberitic Type of Natural Solutions of Salts

The glauberitic type of solutions is formed in the lixiviation by natural waters of glauberite ($CaSO_4 \cdot Na_2SO_4$) from salt-bearing Tertiary deposits of the T'ien Shan. Solutions of the glauberitic type can be characterized by the ratio of the number of moles of $CaSO_4$ to the number of moles of $Na_2SO_4$; this ratio for the mentioned solutions is approximately 0.003 to 1. In the process of metamorphization the glauberitic solutions display a tendency to pass over to solutions of the chloride type. The water of Lake Issyk-Kul' is an example of solutions of the glauberitic type. (RZhGeol, No. 5, 1955) Tr. In-ta khimii Kirgizsk. fil. AN SSSR, No. 5, 1953, 3-8

SO: Sum. No. 744, 8 Dec 55 - Supplementary Survey of Soviet Scientific Abstracts (17)

FRIDMAN, Ya.D.

Processing of salt rocks containing glauberite. Izv.AN Kir.SSR no.1: 23-28 '55. (MLRA 9:9)
(Tien Shan--Salts) (Glauber's salt)

FRIDMAN, Ya.D.; ZINOV'YEV, A.A.; LOPINA, M.D.; DRUZHININ, I.G., redaktor; TSYBINA, Ye.V., tekhnicheskiy redaktor

[Binary sulfates of sodium and calcium and ways of processing them in natural deposits] Dvoinye sul'faty natriia i kal'tsiia i puti pererabotki ikh prirodnykh otlozhenii. Frunze, Izd-vo Akademii nauk Kirgizskoi SSR, 1956. 133 p. (MLRA 10:1)
(Sodium sulfate) (Calcium sulfate)

[redacted], Ye. D.

[redacted], Ye. D.: "The oxidation-reduction transformations of complex compounds." Acad Sci USSR. Inst of General and Inorganic Chemistry imeni N. S. Kurnakov. Moscow, 1954. (Dissertation for the Degree of Doctor in Chemical Sciences)

Source: Knizhnaya letopis' No. 2 1955 Moscow

FRIDMAN, Ya. D.

USSR/ Inorganic Chemistry. Complex Compounds C.

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11449

Author : Fridman Ya.D., Mustayev A.K.
Inst : Institute of Chemistry, Academy of Sciences Kirgiz SSR
Title : Study of Oxythio-Compounds of Antimony. Synthesis of Sodium Oxythioantimonite

Orig Pub : Tr. in-ta khimii, AN KirgSSR, 1956, No 7, 23-28

Abstract : On fusion of $Sb_2S_3$ with $Na_2CO_3$ take place the reaction:

$3Na_2CO_3 + Sb_2S_3 = Na_3SbO_3 + Na_3SbS_3 + 3CO_2$ (on an excess of Na CO) and

$Sb_2S_3 + Na_2CO_3 = NaSbSO + NaSbS_2 + CO_2$ ( on a deficiency in Na CO ).

On fusion of $Sb_2S_3$ with $Na_2SO_4$ the reaction occurs in accordance with the equation $Na_2SO_4 + Sb_2S_3 = NaSbSO + NaSbS_2 + SO_3$. Compound NaSbSO, m.p. 625°, forms small, lustrous, wedge-shaped crystals, d = 4.17 - 4.18, is

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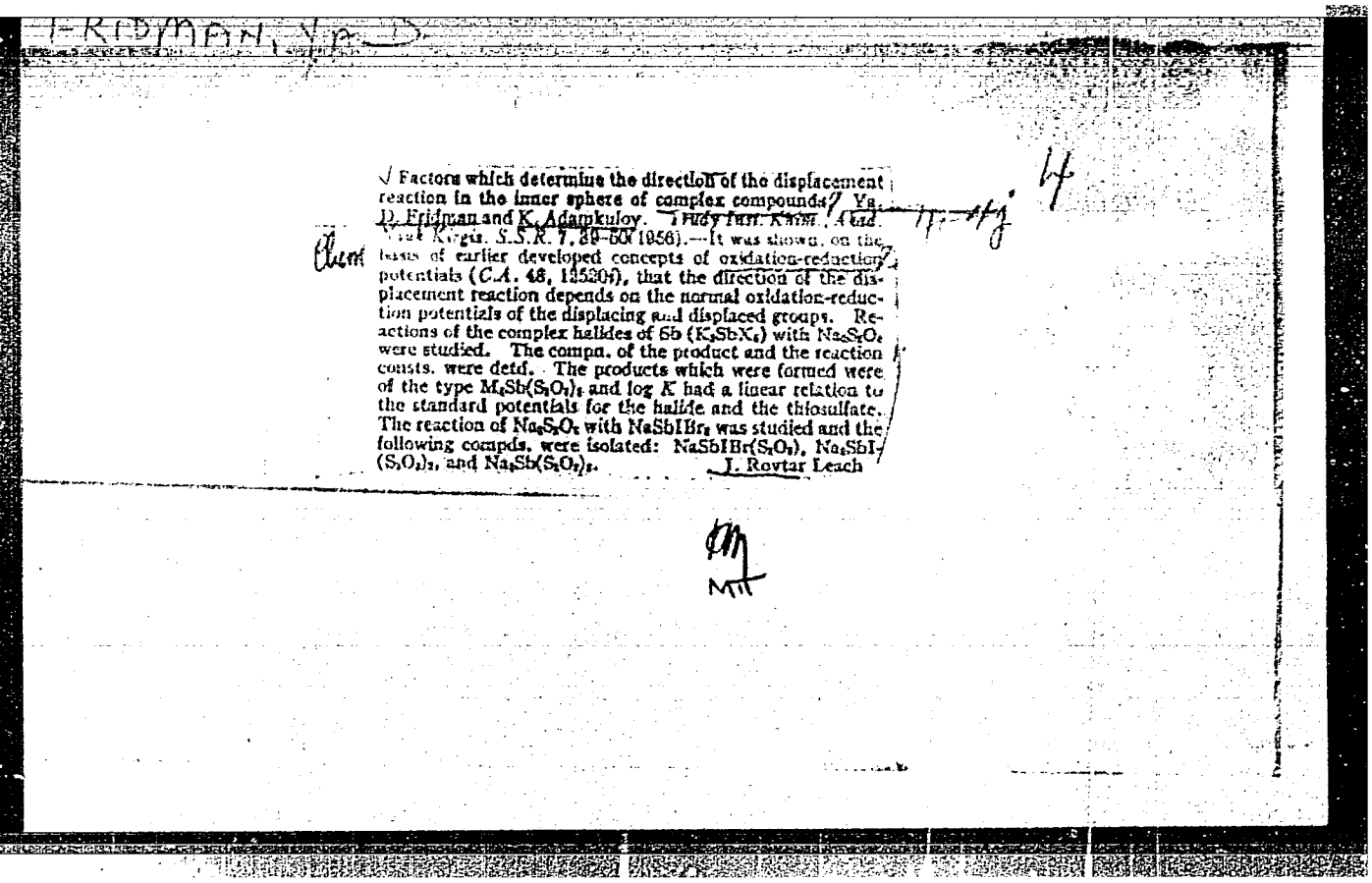
Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11449

appreciably volatile at 900-950°, difficultly soluble in $H_2O$, readily in a solution of $Na_2S$ (with formation of $Na_3SbS_3$), is decomposed by HCl and $H_2SO_4$, difficultly reduced with metallic Fe.



√ Factors which determine the direction of the displacement reaction in the inner sphere of complex compounds. Ya. D. Fridman and K. Adamkuloy. Trudy Inst. Khim., Akad. Nauk Kirgiz. S.S.R. 7, 89–100 (1956).—It was shown, on the basis of earlier developed concepts of oxidation-reduction potentials (*C.A.* 48, 12520f), that the direction of the displacement reaction depends on the normal oxidation-reduction potentials of the displacing and displaced groups. Reactions of the complex halides of Sb ($K_3SbX_6$) with $Na_2S_2O_3$ were studied. The compn. of the product and the reaction consts. were detd. The products which were formed were of the type $M_3Sb(S_2O_3)_3$ and log $K$ had a linear relation to the standard potentials for the halide and the thiosulfate. The reaction of $Na_2S_2O_3$ with $NaSbIBr_2$ was studied and the following compds. were isolated: $NaSbIBr(S_2O_3)$, $Na_3SbI(S_2O_3)_2$, and $Na_3Sb(S_2O_3)_3$. J. Rovtar Leach

AUTHOR: Fridman, Ya. D. SOV/78-3-8-24/48

TITLE: Redox Interactions in the Coordination Sphere (Okislitel'no-vosstanovitel'nyye vzaimodeystviya v koordinatsionnoy sfere)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1958, Vol. 3, Nr 8, pp. 1865-1875 (USSR)

ABSTRACT: It was shown that the ions and atomic groups in the coordination sphere of the complexes develop a certain redox potential. This potential is called innermolecular potential; it is characteristic of complex compounds. The innermolecular potentials are determined by means of thermodynamic data. They were determined for some addenda of the coordination sphere. There exists a dependence between the innermolecular potentials, the nature of the central atom and the coordination number. Some conditions were found on which the decomposition of the coordination sphere occurs due to the reduction of the central ion of the coordination addenda. These decomposition potentials are termed critical potentials of the addenda. Some factors determining the innermolecular potentials were explained and some rules governing the redox interaction in the coordination sphere were given.

Card 1/2

Lab. Non Ferrous Metallurgy, AS KirSSR

Submitted May 1957

5(2) SOV/78-4-8-24/43

AUTHORS: Fridman, Ya. D., Sarbayev, Dzh. S.

TITLE: The Investigation of the Equilibria in a Solution of Heterogeneous Complex Compounds of Metals (Izucheniye ravnovesiy v rastvore geterogennykh kompleksnykh soyedineniy metallov)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 8, pp 1849-1859 (USSR)

ABSTRACT: In the investigation of the redox properties of complex compounds the authors arrived at the conclusion that each ion, atom and reagent which is in the coordination sphere has a certain redox potential, the value of which depends on its individual properties and on the type and the intensity of its interaction with the substituents of the same sphere (Refs 1-4). This potential was termed by the authors as inner molecular redox potential. On the basis of these concepts the summarized thermodynamical values could be split up into components for the individual substituents of the complex compound. The solubility of copper thiocyanate and -iodide in solutions of potassium thiocyanate, -iodide, -bromide and chloride was investigated at 25°. The formation of heterogeneous compounds in the system $Cu^+ - J^- - SCN^- - (H_2)$ could be proved by the

Card 1/3

The Investigation of the Equilibria in a Solution of Heterogeneous Complex Compounds of Metals

high solubility of copper thiocyanate in a potassium iodide solution, the different solubility of copper thiocyanate and copper iodide in potassium iodide solution and the considerable deviation of the solubility of copper thiocyanate in potassium iodide- and potassium thiocyanate solution from the additivity. Heterogeneous complexes in the dissolution of copper iodide in aqueous solution of potassium bromide and potassium chloride were found as well. The formation constants of these complexes, which are the thiocyanoiodo -, iodobromo- and iodochloro derivatives of monovalent copper and which have different composition were computed. The thermodynamical values for the interaction of the ions were computed on the basis of the concepts of the inner molecular potential. In compounds CuJX ($X = SCN^-, Br^-, Cl^-$) the $X^-$-ions weaken the Cu-J-bond. This effect increases with the reducing property of the substituent. The stability of the heterogeneous compounds is based on the joint reducing action of the different substituents on the central ion. There are 7 figures, 8 tables, and 18 references, 14 of which are Soviet.

SOV/78-4-8-24/43

The Investigation of the Equilibria in a Solution of Heterogeneous Complex Compounds of Metals

ASSOCIATION: Laboratoriya tsvetnoy metallurgii AN Kirgizskoy SSR (Laboratory of Metallurgy of Nonferrous Metals of the AS Kirgizskaya SSR)

SUBMITTED: February 25, 1958

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SOROCHAN, R.I.; FRIDMAN, Ya.D.

Effect of current density on the decomposition potential of sulfide-alkali solutions of antimony. Izv.AN Kir SSR.Ser.est.i tekh.nauk 2 no.2:121-129 '60. (MIRA 14:10)
(Antimony) (Electrolysis)

FRIDMAN, Ya.D.; IGNAT'YEVA, Ye.M.

Antimony xanthates. Izv.AN Kir SSR.Ser.est.i tekh.nauk 2 no.2:131-136 '60. (MIRA 14:10)
(Flotation--Equipment and supplies) (Xanthic acid)

FRIDMAN, Ya.D.; KLESOV, N.M.

Obtaining alumina from syenites. Izv.AN Kir SSR.Ser.est.i tekh.nauk 2 no.2:137-146 '60. (MIRA 14:10)
(Syenite) (Alumina)

69012

5.2620

AUTHORS: Fridman, Ya. D., Sarbayev, Dzh. S., Sorochan, R. I.

S/078/60/005/04/007/040
B004/B007

TITLE: Investigation of the Equilibria in Solutions of Complex Compounds of Metals. Mixed Halides of Lead and Heterogeneous Cadmium

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol 5, Nr 4, pp 791 - 804 (USSR)

ABSTRACT: The authors describe a potentiometric method of investigating the equilibrium in solutions of complex compounds containing two different halogens. They mention the following experimental data: Table 1: Electrode potential of Cd-amalgam in chloride-bromide solutions; table 2: the same in bromide-iodide solutions at 25°; table 3: the same in chloride-iodide solutions at 50°; table 4: electrode potential of lead amalgam in chloride-bromide solutions; table 5: the same in bromide-iodide solutions. The potentials were measured by means of a PPTV-1 potentiometer. On the basis of experimental data the equilibrium curves for mixed halogen compounds of cadmium (Figs 1-3) and lead (Figs 5,6) at 25° as well as at 50° (Cd - figure 4, Pb - figure 7) were drawn at a constant ion strength of 5. The authors found that in the solutions of the halogen compounds of Pb and Cd compounds of the type $MX_{3-j}Y_j^{2-}$ and

Card 1/2

FRIDMAN, Ya.D.

Interference of atoms in coordinated inner spheres. Zhur. neorg. khim. 6 no.7:1501-1512 Jl '61. (MIRA 14:7)
(Complex compounds)

FRIDMAN, Ya.D.; SARBAYEV, S., Dzh.; VERESOVA, R.A.

Stability of mixed silver halides in solutions. Zhur.neorg.khim. 7 no.2:305-311 F '62. (MIRA 15:3)

1. Akademiya nauk Kirgizskoy SSR.
(Silver halides)

FRIDMAN, Ya.D.; SOROCHAN, R.I.; DOLGASHOVA, N.V.

Stability in solutions of mixed thallium and indium halides.
Zhur.neorg.khim. 7 no.9:2127-2133 S '62. (MIRA 15:9)
(Thallium halides) (Indium halides)

FRIDMAN, Ya.D.; DRACHEVSKAYA, R.K.; DOLGASHOVA, N.V.

Adsorption of cadmium and zinc from ammonium iodide solutions on a cation exchanger. Izv. AN Kir. SSR. Ser. est. i tekh. nauk 5 no.1:97-101 '63. (MIRA 16:11)

FRIDMAN, Ya.D.; SARBAYEV, Dzh.S.

Stability of mixed thiogenate halo compounds of cadmium in solutions. Izv. AN Kir. SSR. Ser. est. i tekh. nauk 5 no.1:125-133 '63. (MIRA 16:11)

FRIDMAN, Ya.D.; VERESOVA, R.A.; DOLGASHOVA, N.V.; SOROCHAN, R.I.

Formation of mixed comples compounds of metal oxalates in ethylenediamine solutions. Zhur.neorg.khim. 8 no.3:676-684 Mr '63. (MIRA 16:4)

1. Akademiya nauk Kirgizskoy SSR.
(Oxalates) (Complex compounds) (Ethylenediamine)

FRIDMAN, Ya.D.; DOLGASHOVA, N.V.

Fluocarbonates of rare-earth elements. Zhur. neorg. khim. 9 no.3:623-632 Mr '64. (MIRA 17:3)

1. AN Kirgizskoy SSR.

L 8146-66 EWT(m)/EWP(b)/EWP(t) IJP(c) JD/JG/JW

ACC NR: AP5027208 SOURCE CODE: UR/0078/65/010/011/2477/2483

AUTHOR: Fridman, Ya. D.; Moshkina, V. A.; Gorokhov, S. D.; Nitsovich, E. A.

ORG: None

TITLE: Formation and thermal decomposition of yttrium fluoride and carbonate

SOURCE: Zhurnal neorganicheskoy khimii, v. 10, no. 11, 1965, 2477-2483

TOPIC TAGS: fluoride, carbonate, yttrium compound, thermal decomposition, sodium compound

ABSTRACT: A study was made of the reaction of yttrium fluoride with sodium carbonate in the temperature interval from 150 to 900 C, and of the thermal decomposition of yttrium fluoride and carbonate. The reaction was studied by thermogravimetric and thermographic methods. In the thermogravimetric investigations, weighed amounts of the salts were mixed in a platinum crucible and held in a muffle furnace at a given temperature to constant weight (from 15 to 25 hrs). The decomposition products were analyzed and their composition determined. The thermographic investigations were made in a Kurnakov pyrometer using platinum-platinum rhodium thermocouples. Weighed portions of the salts

UDC: 546.643'161+546.643'264

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(0.5-1.0 grams) were mixed in a sliver crucible into which the junctions of the thermocouples were inserted directly. The heating time to the maximum temperature was 3-5 hours. Results showed that yttrium carbonate dissociates in the temperature interval 155-700 C according to the following scheme:

$$Y_2(CO_3)_3 \cdot 3H_2O \xrightarrow{155^\circ C} Y_2(CO_3)_3 \xrightarrow{250-400^\circ C} Y_2O_3 \cdot 0{,}2CO_2 \xrightarrow{400-700^\circ C} Y_2O_3$$

Yttrium fluoride dissociates in the temperature interval 450-800 C according to the scheme:

$$YF_3 \xrightarrow{650-650^\circ C} YOF \xrightarrow{650-800^\circ C} Y_2O_3$$

with the formation of intermediate products. Results of the reaction of yttrium fluoride with sodium carbonate permit the deduction that in the temperature interval 550-700 C the reaction in the system corresponds to the overall equation:

$$2YF_3 + 3Na_2CO_3 = Y_2O_3 + 6NaF + 3CO_2$$

L 8146-66

ACC NR: AP5027208 O

In the temperature interval 800-850 C, with an excess of sodium carbonate, $Na_2CO_3$ reacts with yttrium oxide with the probable formation of compounds with the composition $NaYO_2$. Orig. art. has: 10 figures and 5 tables.

SUB CODE: GC, IC/ SUBM DATE: 21Apr64/ ORIG REF: 008/ OTH REF: 003

jw

Card 3/3

FRIDMAN, Ya.D.; MOSHKINA, V.A.; GOROKHOV, S.D.; NITSEVICH, E.A.

Formation and thermal dissociation of yttrium fluoride and carbonate. Zhur. neorg. khim. 10 no.11:2477-2483 N '65. (MIRA 18:12)

1. Submitted April 21, 1964.

FRIDMAN, Ya.D.

Conditions for the formation of mixed complex compounds of metals. Zhur.neorg.khim. 11 no.1:111-119 Ja '66.
(MIRA 19:1)

1. Submitted June 8, 1964.

FRIDMAN, Ye.G.

Use of double contrast and pneumoperitoneum in the X-ray examination of patients with resected stomach. Vest. rent. i rad. 38 no.5:46-50 S-O'63 (MIRA 16:12)

1. Iz rentgenovskogo otdela (zav. - prof. I.L.Tager) Instituta eksperimental'noy i klinicheskoy onkologii (dir. - deystvitel'nyy chlen AMN SSSR prof. N.N.Blokhin) AMN SSSR.

FRIDMAN, Ye.I., inzh.; BELYAYEV, M.M., inzh.; SERCHUGOVA, A.V., inzh.

Properties of K-211-3, FKPM-15T and AG-4S phenolic plastics. Vest.elektroprom. 31 no.2:20-23 F '60. (MIRA 13:6)
(Phenol condensation products)

S/081/61/000/020/088/089
B110/B147

AUTHOR: Fridman, Ye. I.

TITLE: Properties of new impregnating products

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 20, 1961, 465, abstract 20P141 (Vestn. elektroprom-sti, no. 1, 1961, 9-14)

TEXT: The properties of various impregnating products (polyester varnishes КП-10, (KP-10), КП-18 (KP-18), thermoreactive varnishes ФЛ-98 (FL-98), АФ-17 (AF-17) on the basis of organic solvents, and the multicomponent alkyd styrene organosilicon varnish 100 АСФ (100 ASF)) were examined in standard samples and finished products. The following characteristics are indicated and discussed: polymerization rate in a thick layer, cementing capacity, electrical properties at high and low temperatures and after the action of tropical humidity. In addition, tests with these materials were conducted in transformer coils calculated for operation at 135°C, in order to establish the optimum conditions of impregnation and polymerization as well as the resistance to thermal aging and thermal shocks. The following test results were found: In

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standard samples, KP-10 and KP-18 sometimes display poorer properties than 100 ASF and AF-17 (especially regarding moisture stability). In finished products (transformers) their properties are not inferior to those of 100 ASF and AF 17. KP-10, KP-18, and 100 ASF can be used between -60 and +150°C. The heat resistance of KP-10 and KP-18 is higher than that of 100 ASF as they can be used at 200°C. In comparison with ordinary varnishes, KP-10 and KP-18 polymerize sooner, and their effect upon the enamel insulation of wires is weaker. They can be used to manufacture radioelectronic (mainly 1-f) apparatus and also in cases where coatings on products for use in tropical climate are required. KP-10 displays better impregnating properties as well as higher and more stable characteristics. [Abstracter's note: Complete translation.]

Card 2/2

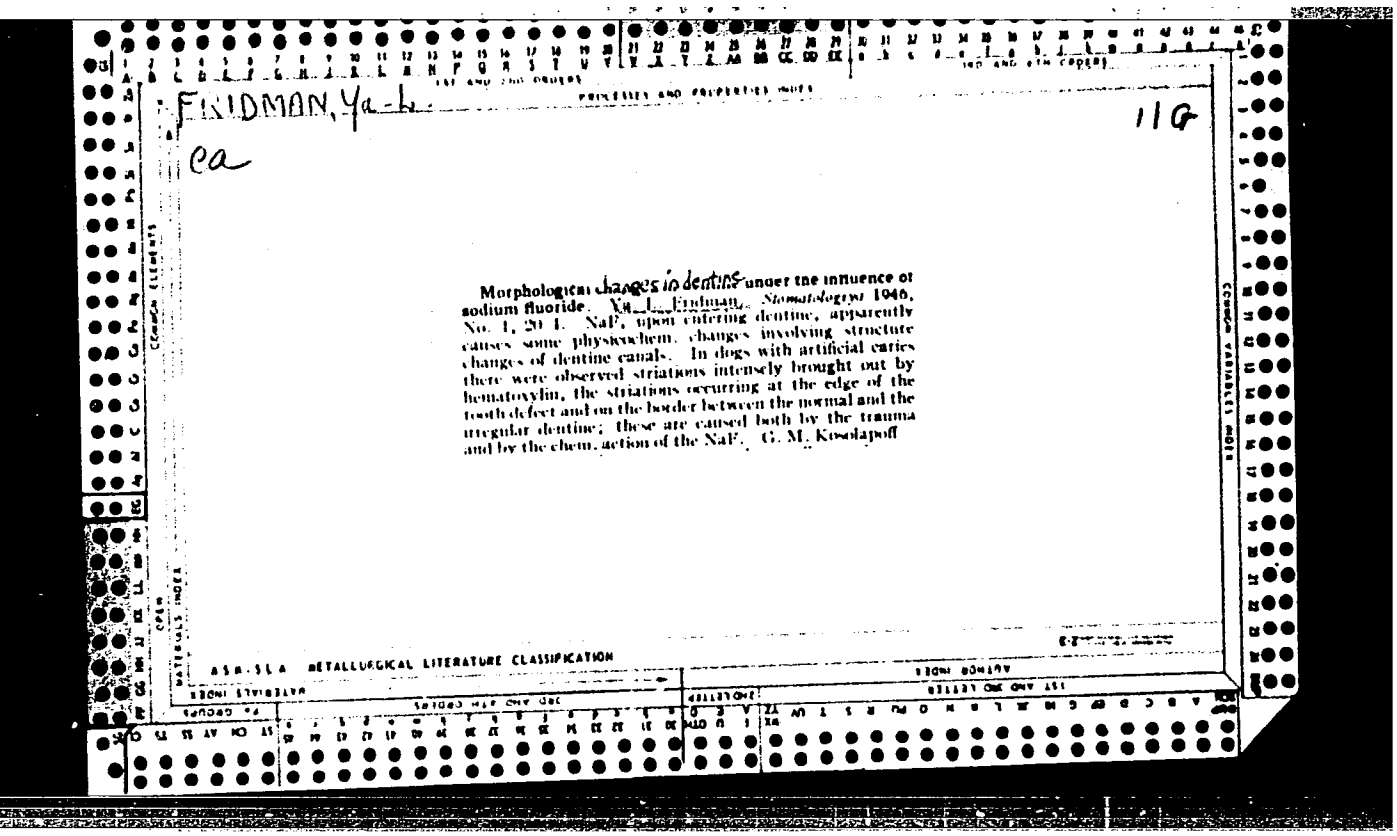
FRIDMAN, Ye.I., inzh.

Properties of epoxide resin base compounds. Vest. elektroprom. 34 no.3:37-42 Mr '63. (MIRA 16:8)

(Electric insulators and insulation)

FRIDMAN, Ye.I.

New BD-11 make drum barker with one enclosed section. Bumagodel. mash. no.11:168-174 '63. (MIRA 17:6)



FRIDMAN, Ya. L.

ca

110

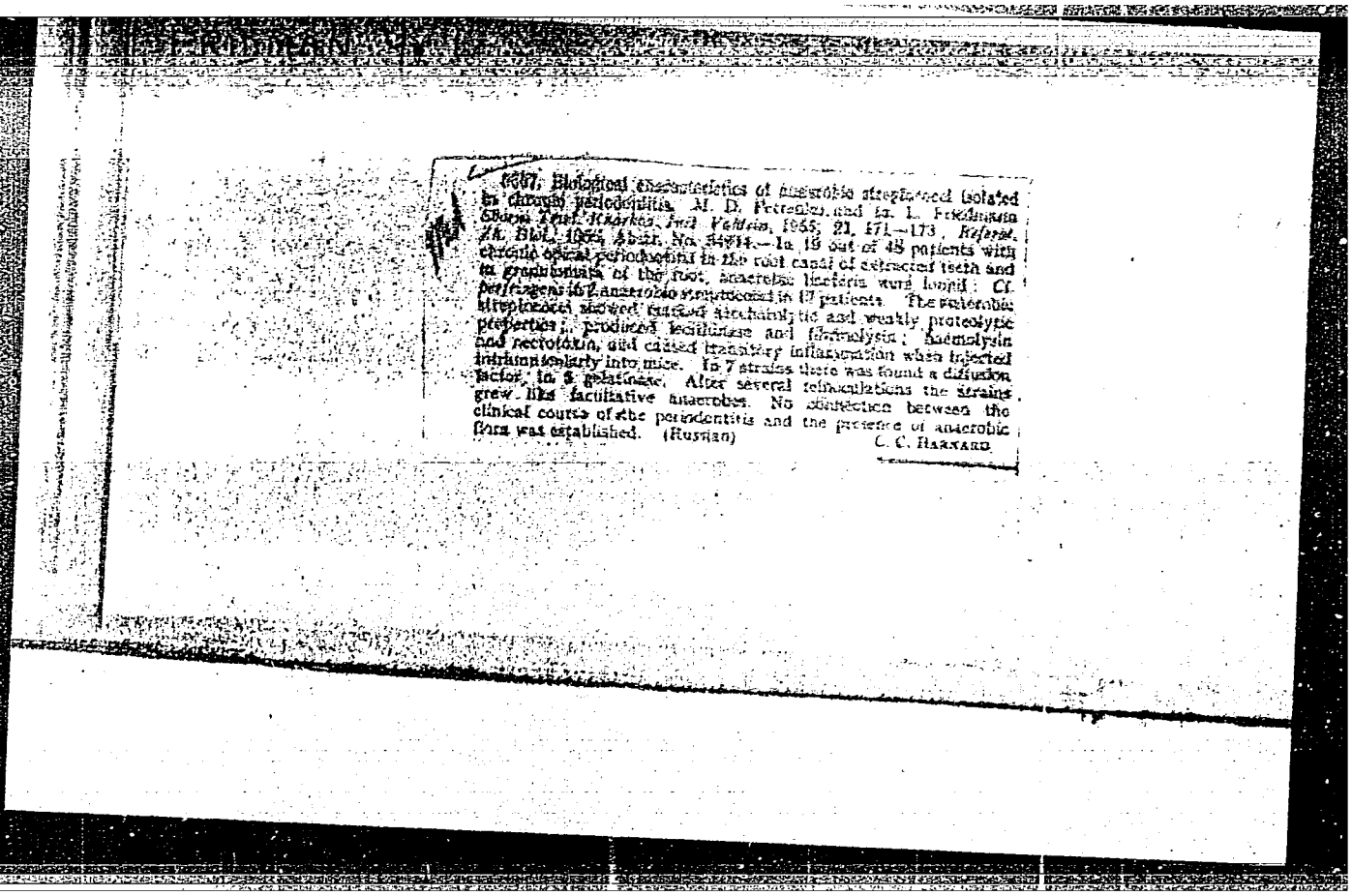
Morphological changes in dentine under the influence of sodium fluoride. Ya. L. Fridman. *Stomatologiya* 1946, No. 1, 20 1. NaF, upon entering dentine, apparently causes some physicochem. changes involving structure changes of dentine canals. In dogs with artificial caries there were observed striations intensely brought out by hematoxylin, the striations occurring at the edge of the tooth defect and on the border between the normal and the irregular dentine; these are caused both by the trauma and by the chem. action of the NaF. G. M. Kosolapoff

A.S.M.-S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

FRIDMAN, Ya. L.

"The Use of Vicasol Vitamin $K_3$ in the Treatment of Gingivo-Stomatitis," Stomatologiya, Nol. 1948.

Kharkov Stomatol Inst.



1567. Biological characteristics of anaerobic streptococci isolated in chronic periodontitis. M. D. Petrenko and G. L. Feldmann. *Sborn. Trud. Kharkov. Inst. Vaktsin.* 1955, 21, 171–173. *Referat. Zh. Biol.*, 1956, Abstr. No. 54914.—In 19 out of 48 patients with chronic apical periodontitis in the root canal of extracted teeth and in granulomata of the root, anaerobic bacteria were found; *Cl. perfringens* in 2, anaerobic streptococci in 17 patients. The anaerobic streptococci showed mixed short chains; the acid weakly proteolytic properties; produced lecithinase and fibrinolysin; haemolysin and necrotoxin, and caused transitory inflammation when injected intramuscularly into mice. In 7 strains there was found a diffusion factor, in 5 gelatinase. After several reinoculations the strains grew like facultative anaerobes. No connection between the clinical course of the periodontitis and the presence of anaerobic flora was established. (Russian)

C. C. Barnard

FRIDMAN, Ya.L., dotsent (Khar'kov); GOL'DOVA, T.G., kandidat meditsinskikh nauk (Khar'kov); MEZHOVA, A.I., kandidat meditsinskikh nauk (Khar'kov)

Using penicillin in the treatment of subacute apical peridontitis of teeth with a single root. Probl. stom. 3:105-108 '56 (MLRA 10:5)

(PENICILLIN) (TEETH--DISEASES)

FRIDMAN, Ya.L., dotsent (Khar'kov); GOL'DOVA, T.G., kandidat meditsinskikh nauk (Khar'kov)

Compound method for treating subacute and chronic periodontitis of multirooted teeth. Probl. stom. 3:145-148 '56 (MLRA 10:5)
(TEETH--DISEASES)

FRIDMAN, Ya.L., dots. (Khar'kov); VAYNDRUKH, S.A., dots. (Khar'kov); REUSOVA, Ye.P., kand.med.nauk (Khar'kov)

Clinical and radiological investigation of the condition of the periodontium in students of the Kharkov Medical Stomatological Institute. Probl.stom. 4:179-183 '58. (MIRA 13:6)
(GUMS--DISEASES)

FRIDMAN, Ya.L.

Radioscopic and morphological comparisons in chronic apical periodontitis. Probl. atom. 5:180-187 '60. (MIRA 15:2)

1. Khar'kovskiy meditsinskiy stomatologicheskiy institut.
(TEETH--RADIOGRAPHY) (TEETH--DISEASES)

FRIDMAN, Ya.L.

Clinical and radioscopic comparisons in chronic apical periodontitis, Probl. stom. 5:188-193 '60. (MIRA 15:2)

1. Khar'kovskiy meditsinskiy stomatologicheskiy institut.
(TEETH--RADIOGRAPHY) (TEETH--DISEASES)

GIL'MAN, L.A., prof.; FRIDMAN, Ya.L., dotsent; KISELEVA, M.M., dotsent

State of health in children with multiple dental caries. Stomatologiia 39 no.6:16-20 N-D '60. (MIRA 15:1)

1. Iz kafedry pediatrii (zav. - prof. L.A.Gil'man) i kafedry terapevticheskoy stomatologii (zav. - dotsent Ya.L.Fridman) Khar'kovskogo meditsinskogo stomatologicheskogo instituta (dir. - dotsent G.S.Voronyanskiy).
(TEETH--DISEASES) (CHILDREN--CARE AND HYGIENE)

AUTHORS: Lepeyko, I.P., and Fridman, Ya.N., Engineers SOV/135-59-8-10/24

TITLE: The Use of Natural Gas for Cutting and Welding of Metals

PERIODICAL: Svarochnoye proizvodstvo, 1959, Nr 8, pp 31-35 (USSR)

ABSTRACT: In the Khar'kov electro-mechanical plant imeni Stalin the natural gas found in the deposits of Shebelinka is widely used to cut steels and to weld and solder non-ferrous metals and cast iron. The natural gas of this deposit contains 94% of methane and 6% of heavy hydrocarbons. Its heating power is about 8500 Kcal/$m^3$ and the burning temperature about 2000°C. The working data for the cutting and soldering were compiled by the welding laboratory and the welding department of the plant. The directions given by the VNIIAVTOGEN (The Utilization of Gases - Substitutes for Acetylene in Oxygen Flame Cutting of Metals, Mashgiz 1958) were taken as initial data in adjusting the diameters of the openings of the outer mouth pieces of the flame cutter UR. The dimensions of the injector openings and the inner mouth pieces were set by experiments.

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The Use of Natural Gas for Cutting and Welding of Metals

The cutting data were worked out on the hand flame cutter UR, the semi-automatic cutter PL-1, and the automatic cutters ASSh-1 and ASh-1. The working data and the equipment were tested with a pressure which went up to 10 Atm in the system of the oxygen and 0.5 Atm in that of the natural gas. As a result of the tedious tests the diameters for the injectors, the mixer chamber, and the outer and inner mouth pieces were set as they are given in table 1 and the drawings 1-6. The outer mouth piece of the flame cutter for mechanical cutting was altered - the holes for preheating were substituted by one hole which includes the inner mouth piece. Thus the frequent choking of the jets was prevented. Before the introduction of natural gas it had been necessary to interrupt the cutting process from time to time to clean the jet. During the first month of working with natural gas the production norm dropped by 24%, but when the workers had accustomed themselves to the cutting with natural gas the norm exceeded that of using acetylene. At the present time

natural gas is used for flame-cutting metals of a thickness up to 250 mm. When natural gas was introduced the working places were arranged in a straight line and equipped with special shelves under which were conveyers for the mechanical removal of slags. In acetylene-oxygen welding the cut is usually interrupted and scorious. In cutting with natural gas the cut has a clean surface. This helped to reduce the labor spent on cleaning the details from the slags after the cutting. Simultaneously with the introduction of natural gas for the cutting of metals devices were tested in the plant to weld and solder non-ferrous metals and cast-iron. The use of flame cutters with the characteristic given above permits to change completely to using natural gas in soldering and welding of metals and in welding blow-holes in cast-iron. Acetylene is now used in the plant only for autogenous welding of thin-plated steel parts and pipes. At the present time burners for soldering with natural gas without oxygen are produced in the plant and introduced

in the production. The studies carried out in the field of welding cast-iron with natural gas, which were conducted in collaboration with the welding laboratory of the KhTGZ imeni Kirov, led to good results in regard to the applicability of the parts welded together with build-up welding. It was found: a) all spots of the build-up weld can be processed with completely satisfactory effect, and there is little difference in the processing of gray cast-iron; b) cast iron as well as brass can be processed a little bit better than after welding with acetylene. The authors come to the following conclusion: In changing to natural gas the existing flame cutters for manual cutting may still be used; only the outer mouth pieces have to be altered, the inner ones remain the same. The other changes are contained in tables 1 and 2. The apparatus which was built and applied in the plant produced satisfactory results in manual and automatic cutting of metals, and in gas welding and soldering of non-ferrous metals and cast-iron. The productivity

The Use of Natural Gas for Cutting and Welding of Metals

of work did not drop in the change from acetylene to natural gas. The acetylene station could now be used for other purposes in the production, and it was possible to employ the working personnel in other processes. The quality of the metal cuts was improved and labor saved in removing the slags after the cutting. It is obvious that it is practical to introduce natural gas in gas-welding and cutting processes where there is not centralized supply of acetylene. There are 3 tables, 8 diagrams and 2 photographs.

ASSOCIATION: Khar'kov elektromekhanicheskiy zavod imeni Stalina (Khar'kov Electro-Mechanical Plant imeni Stalin )